

# **TRANSLATOR'S CERTIFICATION**

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**Title of Document :**

**Korean Patent Application No. 2000-47939  
"REMOTE CONTROL DEVICE OF DISPLAY AND BALL  
SWITCH"**

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**I certify that the specification was translated by me and further certify  
that the translation is true and accurate to the original, Korean patent  
Application No. 2000-47939.**

**Seong Hwan, VAHC**

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# SPECIFICATION

## Title of Invention

5       **REMOTE CONTROL DEVICE WITH DISPLAY AND BALL SWITCH**

## Brief Description of the Drawings

- 10   FIG. 1 illustrates a remote control device according to the present invention.  
FIG. 2 is a perspective view of the function selection ball switch section of the remote control device according to the present invention.  
FIG. 3 is a top view of the function selection ball switch section according to the present invention.
- 15   FIG. 4 is a cross section A-A view of FIG. 3.  
FIG. 5 is a top view of A section in FIG. 3  
FIG. 6 shows the operation status of the function selection ball switch section according to the present invention.  
FIG. 7 shows an example of the operation status of spherical rollers and selection means
- 20   when the ball in the function selection ball switch section is being pushed.  
FIG. 8 is a front view of the machine selection mode from the remote control device according to the present invention.  
FIG. 9 is a front view of the menu selection mode from the remote control device according to the present invention.
- 25   FIG. 10 is a front view of the function selection mode from the remote control device according to the present invention.  
FIG. 11 is a flow chart which illustrate an overall operation process using the remote control device according to the present invention.  
FIG. 12 is a flow chart which illustrate a machine selection process using the remote
- 30   control device according to the present invention.  
FIG. 13 is a flow chart which illustrate a menu selection process of the remote control device according to the present invention.  
FIG. 14 is a flow chart which illustrate a function selection process of the remote control device according to the present invention.

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**<Description of the numeric on the main parts of the drawings>**

- 2: Case
- 3: Display Section
- 4: A First Wheel Operation Section
- 5 5: A First Click Encoder
- 6: Machine Selection Wheel Switch Section
- 7: A Second Wheel Operation Section
- 8: A Second Click Encoder
- 9: Menu Selection Wheel Switch Section
- 10 11: Function Selection Ball Switch Section
- 12: CPU
- 14: Infrared Ray Photoemission Diode
- 13: Memory
- 15: Signal Transmitter
- 15 16: Speaker
- 17: Click Sound Generation Section

**Detailed Description of Invention**

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**Purpose of Invention**

**Field of Invention and Description of Related Art**

25 The present invention relates to a remote control device with displays and ball switches. More particularly, the invention relates to a remote control device with a plurality of functional switches which is capable of readily controlling all functions of an electronic machine using wheels and ball switches from a remote location through infrared light.

30 Also, those functions can be easily selected from a display menu system hence a separate learning process is not required.

Conventionally, a wireless remote control based on the Infrared light signal method was used to control an electronic machine remotely. Initially, these machines were confined to the type of machines such as TV, VCR and A/V, however, the application  
35 area is being continuously enlarged including air conditioners and electric fans due to its proven convenience.

With the fast development of electronic technology, the number of functionality of various electronic machines has increased. As a result, the operation of a remote control device which is capable of controlling various electronic machines has become complicated and a significant time is required to understand the operation method. For the standard users, only the basic functions are being used and even for the skilled users the usage is limited due to their complexity.

The analysis of the presently available remote control devices has revealed the following disadvantages.

Firstly, the size of the control panel has been enlarged due to the increase in the number of switches causing a serious difficulty for memorizing the exact location of each of the switches. Also, during the operation, due consideration is required to make sure that the exact location of a required switch in order not to contact other switches around it.

Secondly, the function display of each switch has been very poor. In case of using a switch for several functions, not all the functions can be displayed. Also there are problems concerning an easy understanding the menu system.

Thirdly, there are tedious problems of having to press repeatedly for some switches such as channel, volume, temperature, time and menu selection.

Fourthly, in case of changing the volume and channel or entering into a complex menu system, there are problems of having to move each of the keys directly and repeating the confirmation and operation processes.

Fifthly, there are problem with the switches being too widely spanned out as well as being too close to each other that it is almost impossible to operate with only one hand.

Also, sometimes for an electronic machine, two separate remote control devices are used for complicated and simple functions respectively, however, there are still problems of having to move frequently to other keys and repeating button pushing.

Due to the inconvenience of using a separate remote control device for each of different machines, an integrated remote control device was proposed. Four different types of remote control devices were proposed, namely, A, B, C and D types. A type is an integrated remote control device mainly for A/V machines with many switches which has 2 to 6 different types. B type is also an integrated remote control device with many switches for all types of electronic machines. C type is a small or card type integrated remote control device for A/V machines which has 2 to 6 different types and contains only the frequently used switches. D type is an integrated remote control device for all types of electronic machines which has a display device and a touch screen where it displays the corresponding switch configuration according to each of the

machines and a selection can be made using the finger.

For the individual push switch type such as A, B, and C, the previously mentioned problems can not be solved. For D type, the problems with the number of switches and their functions can be resolved, however, the inconvenience of repeatedly pushing the buttons and not being able to feel the process of pushing the switch have been appeared  
5 as another problem.

### Technical Object of Invention

10 The present invention is designed to overcome the above problems of prior art. The object of the invention is to provide a remote control device with displays and ball switches which enables a speedy control of all functions of an electronic machine possible through wheels and ball switches. This is achieved by reducing the movement of fingers and providing a displayed menu system where a selection can easily be made  
15 by a click.

In order to achieve the above objectives, the present invention comprises: a case; a display section situated at upper section of the front face of the case; a machine selection wheel switch section which is situated at inside of the case and some parts of the section are exposed through the front face and contains a first wheel operation  
20 section, a first click encoder and a first push sensor; a menu function selection ball switch section which contains a second wheel operation section, a second click encoder and a second push sensor; a function selection ball switch section which is situated at inside of the case and some parts of the section are exposed through the front face; a CPU which inputs, outputs and controls the electric signals generated by rotation of the  
25 machine selection wheel switch section, menu selection wheel switch section and function selection ball switch section; a signal transmitting section in connection with an output and a memory which has built in machine, menu and function selection program; and a click sound generation section with a speaker.

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### Constitution of Invention

Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings.

35 As shown in FIG. 1 to FIG. 10, a remote control device 1 according to the present invention comprises a case which has an inner space, a display section 3 situated at

upper section of the front face which displays the present status in the machine selection, menu selection and function selection, a machine selection wheel switch section 6 which has a first wheel operation section 4, a first click encoder 5 and a first push sensor 4a and a menu selection wheel switch section 9 which has a second wheel operation section 7, a second click encoder 8 and a second push sensor 7a are located  
5 inside of the case 2 at the lower section of the display section 3 while at the same time some parts are exposed to the front face of the case 2.

Also, an opening section 10 with a specific radius is located at the midway between the machine selection wheel switch section 6 and the menu selection wheel switch  
10 section 9, towards the lower end of the case 2. A partially exposed function selection ball switch section 11 is located in the opening section 10.

The present invention further comprises a CPU which inputs, outputs and controls the electric signals which are generated by the operation of the machine selection wheel switch section 6, the menu selection wheel switch section 9 and the function selection  
15 ball switch section 11 and a memory 13 which has built-in machine, menu and function selection program; and a click sound generation section 17 which has a speaker and a signal transmitting section 15 which has a infrared ray photoemission diode 14.

Preferably the case 2 is separated into an upper and lower section case and although not shown, some batteries are placed inside of the case to provide a power source.

20 As shown in FIG. 8 to FIG. 10, the display section 3 comprises a first display area 20 which displays a program name 18 and a machine name 19, a second display area 23 which displays a program list 21 and a menu 22, a third display area 24 which displays the function of a function selection ball switch section 11 and a fourth display area 25 which displays the condition of the operating remote control device.

25 The machine name 19 and program name 18 in the first display area 20 can be scrolled up/down according to the rotation direction of the machine selection wheel switch section 6. The selected part in the middle is indicated by a shaded block.

Also, a matching number of arrows corresponding to the number of hidden machine name 19 and program name 18 are displayed at the top and bottom end of the display  
30 area in order to indicate to the user. In connection with this, the menu list of selected machines and programs are displayed in the second display area 23. In front of a selected program name 18, the start is displayed in order to be able to distinguish the machine name 19.

In the second display area 23, the menu name can be scrolled up/down according to  
35 the rotation direction of the menu selection wheel switch section 9. The selected part in the middle is indicated by a shaded block. Similarly to the first display area 20, a

matching number of arrows corresponding to the number of hidden menu name is displayed at the top and bottom end of the second display area 23. The function of the function selection ball switch section 11 with respect to the selected menu indicated by a shaded block can also be display in third display area 24 at the same time.

- 5     The third display area 24 is switch on/off according to the rotation direction of the function selection ball switch section 9. By rotating the ball while depressing it, the menu advances 10 steps by one click.

Also, at the both ends of the third display area 24, an arrow indicating outwards is displayed in order to show that the year and minute are not being.

- 10    The machine selection wheel switch section 6 and the function selection ball switch section 9 can perform the roles of up, down, rotation and push switches at one specific point and is almost identical to a wheel mouse.

The wheels 26, 27 of the machine and the function selection ball switch section 6, 9 are pushed towards the upper section or lower section, the first and second operation sections 4, 7 which are connected also rotates. The rotated amount is detected by the  
15    first and second click encoders 5, 8 and the detected electric signal is applied to CPU 12. More specifically, through the detected value of the first and second click encoders 5, 8, the program name, machine name, program list or menu display are scrolled to the shaded block by CPU 12.

- 20    In this instance, if the wheel is pressed the electric signals of the first and second push sensors 4a, 7a are applied to CPU 12. As a result, CPU 12 reads the control codes and transmits signals through the infrared ray photoemission diode 14 of the signal transmitting section 15 in order to operate the machines.

As shown in FIG. 2 to FIG. 7, the function selection ball switch section 11 comprises  
25    axis holes 29, 29a, first to fourth fixtures 30-33 with an insertion groove 29b at the center are located in the diagonal direction where each of the four vertexes are facing each other.

Also, a selection means 34 which has the functions of a stopper, acceleration and selection is located between the first & second fixtures 30, 31 and the third & fourth  
30    fixture 32, 33 and a ball 35 is located at the upper center of the selection means 34 and fixed plate 28. At one side of the first to fourth fixtures 30-33, a light emitting section which converts electrical signal into light according to the control signal, a light receiving section which converts the converted light into electric signal again, detecting section 38 which has the function of a switch and also comprises the third to sixth  
35    encoders 34-37 are located. The third to sixth encoders 34-37 detect the operation of the ball 35 in the up, down, left and right directions.

At the end section of the rotational axis 38, which is inserted to the axis holes 29, 29a, is inserted to the third to sixth encoders 34-37. An operation section 41 which has a plurality of wheels 39, 40 is located at a location having a small separation clearance L from the center of the rotational axis 38.

5 Here, the wheels 39, 40 preferably have an uneven surface in order to increase the frictional constant of the circumference of the wheels. The both sides of the wheels 39, 40 should be in contact with the ball 35 simultaneously and the center of the ball 35 should coincide with the center of the rotational axis in order for a precise operation of the wheels.

10 The selection means 34 comprises a hinge section 42 which has a hinge hole 41 between the first and second fixtures 30, 31, a support plate 44 in the shape of "v" which allows the rotational movement using the rotational axis 43 at the hinge hole 41, a stopper in the form of housing which contains a spring 45 and supporting ball 46 at the center of the support plate 44, and a third push sensor 41a located at the upper face  
15 of the fixed plate 28 under the free end of the support plate 44.

The click sound generation section 17 produces a click sound by the third to sixth click encoders 34-37 and simultaneously, according to the variation of detected electric signals produces a unique sound stored in the memory 12 through the control of CPU 12.

For example, the selection of unique sound according to the directions should be  
20 symbolically related to the direction of switch operation so that an upwards direction is a short high pitch note, a downwards direction is a short low pitch note, a left direction is a short high to low flow pitch, a right direction is a short low to high flow pitch and a pushing down direction is a long medium pitch.

Also, as shown in FIG. 7, the ball 35 of the ball switch section 11 is rotated one click  
25 towards the left and again rotated one click upwards, then selection areas in a total of 8 directions can be operated which includes four + type direction such as month, hour, upwards and downwards and x type diagonal directions such as a square display section.

As shown in FIG. 8, the remote control device constructed as above when the machine selection wheel switch section 6 is rotated up or down directions, the program  
30 name 20 of the first display area 20 and machine name 19 is scrolled up or down and at the same time and a shaded block is selected at the middle as well as showing the matching number of arrows corresponding to the hidden number of name at the top and bottom end of the display area.

In this instance, when the selected contents are programs, a list of the programs is  
35 displayed in the second display area 23 and when the selected contents are machines, the menu of the machines are displayed. At the same time, the program selection or



machine selection are displayed in the first display area 20 therefore the contents of the work in progress can more clearly be understood.

When the machine selection wheel switch section 6 is pressed, electric signals applied to CPU 12 by the first push sensor. If the content corresponding to the electric signals is a machine name 19, then the machine is switched on and if the content corresponding to the electric signals is a program name 18, then the machines are switched on according to the sequence of the list contents by transmitting the control signals through of the infrared ray photoemission diode 14 of the signal transmitting section 15. Also, the machine name is moved to a shaded block in the first display area 20 in order to operate the next sequence.

As shown in FIG. 9, if the wheel of the menu selection wheel switch section 9 is rotated up and down, the menu type in the second display area 23 is scrolled up and down and the shaded blocks are being selected.

In this instance, a matching number of arrows corresponding to the number of hidden menu and at the time of first machine selection, the most frequently used menu is displayed in the shaded block.

According to the selected contents, the function of operational direction of the function selection ball switch section 11 is displayed in separate locations in the third display area 24. If there is a need to select according to the menu contents, then by pressing the menu selection wheel switch section 9, electric signals are applied to CPU 12 by the second pushing sensor 7a and in turn CPU 12 transmits the signals via the signal transmitting section 15 in order to control the machine.

As shown in FIG. 10, when the function selection ball switch section 11 is rotated up and down, left and right, electric signals corresponding to the contents displayed in the direction of the third display area 24 are transmitted. If the left and right direction is an auxiliary menu, then the type of the auxiliary menu is scrolled in the left and right directions and a matching number of arrows corresponding to the number of hidden auxiliary menu.

In the fourth display area 25, the contents of the work which the function selection ball switch section 11 is capable of performing is displayed and the list of things that can be performed by pressing and rotating the function selection ball switch 11 in direction display icon of the function selection ball switch section 11.

If there is a need to select according to the function contents, then by pressing the function selection wheel switch section 11, electric signals are applied to CPU 12 by the third pushing sensor 41a and in turn CPU 12 transmits the signals via the signal transmitting section 15 in order to control the machine.

The details of the operation of the function selection ball switch section 11 are as follows. If the ball 35 is pushed towards the direction of the arrow A in FIG. 6, the first & second spherical rollers 50, 51 which are in contact with the ball 35 are pushed an approximately 45degree towards the left side and at the same time are also pushed to the left by the rotation of the support ball 35 of the selection means 34.

While the ball 35 is being pushed through rotation, the outer face of the ball 35 makes a contact with the rotational axis 38 and simultaneously the rotational axis starts to rotate. At the same time, the electric signals are transmitted to CPU 12 through the fifth click encoder 36.

Also, electric signals are applied to CPU 12 by the fifth click encoder 36 located at the end of the rotational axis 38b during the rotation of the ball 39.

By applying signals to CPU 12 by the fifth click encoder 35, CPU 12 recognizes that the ball 39 is moving upwards by comparing with the control codes and as previously mentioned, transmits signals through the signal transmitting section 15 in order to operate the machines.

Also, the unique sound from the memory 13, selected by CPU 12 as a result of electric signals from the fourth click encoder 35 can be sounded through the speaker of the click sound generation section 17.

Electric signals are applied to CPU 12 by the third push sensor 40 at the same when the ball 35 is pressed from top to bottom, hence, as mentioned previously, signals are transmitted through the signal transmitting section 15 in order to operate the machines.

Also, when a finger pressing the ball 39 is removed, the ball 39 is returns to the center up position due to the elastic force of the third push sensor 40.

In the present invention, the function selection ball switch is used in a remote control device, however, it is apparent that it can be used in monitor picture control, car audio control, volume, timer, and color control for TV, home automations.

### **Effect of Invention**

As mentioned thereinbefore, the present invention is rapidly capable of control all functions in the remote control by using wheels and ball switches. And thus, it is conveniently used without requiring an extra training by providing a displayed menu where can be chosen by a click.